Requirements for Submitting Air Dispersion Modeling Analysis

Montana DEQ/ Planning, Prevention & Assistance Division / Monitoring & Data Management Bureau / Analytical Services Section

The following guidance was written in an attempt to summarize and clarify existing dispersion modeling practices and techniques that are available for evaluating air quality impacts from industrial sources. The intent of this guidance is to summarize the information and data elements required for submitting ambient air impact (modeling) analyses which must be included with the permit application in order to minimize the Montana Department of Environmental Quality's (DEQ) review time. The applicant is also referred to the *Montana Modeling Guideline for Air Quality Permits* (*Montana Modeling Guideline*) which presents current DEQ modeling guidance for estimating impacts from stationary sources of air pollution. The *Montana Modeling Guideline* addresses modeling issues for sources of air pollution ranging from small minor sources to major sources subject to the Prevention of Significant Deterioration (PSD) and Nonattainment Area (NAA) permitting programs. In addition, the *Montana Modeling Guideline* contains a modeling checklist for the applicant to use to ensure that all of the necessary information is submitted.

For questions and information related to this guidance or general modeling questions, please contact Angelia Haller of the Monitoring and Data Management Bureau at (406) 444-2619 or by email at ahaller@state.mt.us. For questions and information related to information required in the air permit application or the review process; please contact Dan Walsh of the Air & Waste Management Bureau at (406) 444-0285 or by email at dwalsh@state.mt.us.

REQUIREMENTS

1. Provide justification of the use of:
   a. Short Term or Long Term models based on the current version of each model. Specify model version used for any analysis performed.
   b. Simple or Complex Terrain based on a description of the local and regional topography.
   c. Various Sources Types (Point, Line, Flare, Area or Volume).
   d. Building Downwash influences for stack heights less than Good Engineering Practice (GEP).

2. Provide a facility plot plan that is drawn to scale and depicts the Universal Transverse Mercator (UTM) coordinates of the facility property fence line, buildings and structures, and the locations of all point, area, line, and volume sources. The plot plan should also depict the UTM legal locations of the nearest quarter section corner for reference.

3 Provide a table with the following data for **each** emission source represented in the modeling analyses:
   a. The emission rates for each modeled pollutant in grams/sec (g/s), pounds/hour (lb/hr) and tons/year (tpy) quantities. The emission rate modeled is subject to becoming a limit so specify whether potential, allowable or actual rates are being used in the model.
   b. The source location in UTM coordinates (UTM Zone, UTM Easting (X), UTM Northing (Y), Source Base Elevations).
   c. Source release parameters for all applicable operational scenarios proposed in the permit application:

Modeled Point Sources:

i. Stack Emission Rate (specify actual, allowable or potential emissions) (g/s)
ii. Stack Release Height (m)
iii. Stack Exhaust Temperature (°F)
iv. Stack Release Velocity (m/s)
v. Stack Exit (inner) Diameter (m)

Modeled Area and Volume Sources:

i. Source Emission Rate (specify actual, allowable or potential emissions) (g/s)
ii. Source Release Height (m)
iii. Initial Lateral Dimension (sigma-y)
iv. Initial Vertical Dimension (sigma-z)
v. Overall Dimensions of the Source (m)

Consult the ***User's Guide for Industrial Source Complex (ISC3) Dispersion Models Volume I – User Instructions*** for procedures to estimate Area and Volume source dimensions.

4. The applicant will provide an emission inventory for all nearby sources consisting of the information requested in Item #3 and should identify all increment consuming sources and dates of construction. The applicant is referred to DEQ files for this information and may wish to contact the Air & Waste Management Bureau for questions relating to all nearby sources to include in the modeling analysis. For PSD applicants, emissions sources located in adjacent states may also have to be included as part of the emission inventory.

5. Provide a table which lists the names and dimension (length, width, height) for all buildings and structures represented in the building downwash analysis; the identification or name of each building included in the Building Profile Input Program (BPIP) must be referenced on the facility plot plan.

6. Provide the BPIP input and output data files. Building downwash influence parameters for nearby facilities may also be required, and the applicant should contact DEQ for specific guidance on including downwash before submitting a modeling analysis.

7. Generate receptor grids using UTM coordinates in rectangular Cartesian arrays based on terrain elevation data taken from USGS 7.5 minute topographical maps or Digital Elevation Model (DEM) files as follows:
   a. 50 m spacing along the facility fenceline or plant works boundary.
   b. 100 m spacing from the proposed fenceline out to 1.0 kilometer (km).
   c. 250 m spacing from 1.0 km to 3.0 km.
   d. 500 m spacing from 3 km to 10 km.
   e. 1000 m spacing beyond 10 km.
   f. Place a 10 x 10 (100 m spacing) receptor grid centered on any maximum modeled impact that occurs at a receptor located in a 250 m, 500 m, or 1000 m receptor grid.
   g. Use adequate receptor spacing to validate compliance if the modeled impact is close to the standard.

8. Provide the DEM files used in the modeling analysis and the names of the corresponding Quadrangle maps:
   a. Submit Quality Assurance/ Quality Control (QA/QC) documentation used to verify the accuracy of the terrain data.
   b. Submit a plot of the DEM data to verify it matches the corresponding 7.5 minute Quadrangle maps.
   c. Locate the proposed source or modification on the terrain data plot requested above.

9. Use the most recent five-year period of meteorological data that are representative of the geographic area to be simulated in the modeling analysis. At least one year of onsite meteorological data may also be required to fulfill this requirement. Contact DEQ for specific guidance on selecting and obtaining the correct meteorological data for each proposed source or modification prior to submitting any modeling analyses.

10. Document and submit QA procedures followed in preparing any meteorological data. A wind rose and wind frequency statistical data should be submitted as part of this requirement.

11. Run the model using all regulatory defaults. Create at least three (3) source groups that include all **New**, **Nearby**, and **Increment** consuming sources that are represented in the modeling analysis.

12. Provide a summary table which lists the modeled concentrations used in the modeling analysis and include receptor locations of the maximum impacts for all of the source groups listed in Item #11 for comparison to the National and Montana Ambient Air Quality Standards (NAAQS and MAAQS). For PM_{10}, SO_2, NOx, and CO modeling analyses, the highest second highest design concentrations, meteorological year, and receptor locations should be provided as well. Table 1 provides an example of the information to be included in all submitted reports.

Table 1. Summary of Modeling Information to be Provided for all Modeling Analyses

Modeled Source	Pollutant Design Conc. (lb/hr)	Avg. Period	Met Data Year	Receptor Data		Predicted Concentrations			Standards		Compliance Status
				X (km)	Y (km)	Modeled Conc. ($\mu g/m^3$)	Back-ground Conc. ($\mu g/m^3$)	Total Ambient Conc. ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	MAAQS ($\mu g/m^3$)	In/Out
		1-hr									
		3-hr									
		8-hr									
		24-hr									
		Annual									

13. Provide the following plots:
   a. Plots showing all receptor locations used in the modeling analysis with the proposed facility boundary or facility fenceline, and show the location of all nearby facilities.
   b. Plots, which depict the magnitude and the location of the maximum-modeled impacts for each pollutant, with the meteorological year associated with the maximum impact.
   c. If applicable, provide electronic copies of all Surfer *.dat, *.grd, and *.srf plotting files used in the modeling analyses. Include the *.bln fenceline Surfer boundary file comprised of the fenceline receptors.

14. Provide an electronic copy of all files used in the modeling analyses on compact disks (CDs), and provide a table which lists the names of all files submitted with the application along with a description of the file content.

FOR PSD ANALYSES AND COMPLIANCE DEMONSTRATION

Contact Dan Walsh to arrange a pre-application meeting before any modeling analysis is submitted on behalf of a proposed PSD application. The necessity of meeting with the appropriate Federal Land Manager (FLM) will be determined during the pre-application meeting and DEQ may contact the appropriate FLMS to set-up a meeting if requested by the applicant.

15. Define the existing air quality at the proposed site including information regarding any ambient monitoring that has been conducted in the past or any ongoing monitoring activities in the region.

16. Submit tables and plots that depict the radius of impact from the proposed source or modification for all applicable averaging periods for each pollutant emitted in significant quantities. The Table 2 provides a listing of modeling significance values, ambient air quality standards (NAAQS/MAAQS), and PSD increments for all criteria pollutants and other pollutants that have designated significance values.

Table 2. NAAQS/MAAQS, PSD Increments, Modeling Significance Levels and Monitoring De Minimis Concentrations

Pollutant	Avg. Period	MAAQS	NAAQS	PSD Increments ($\mu g/m^3$) Class I	Class II	PSD Significant Emission Rate (TPY)	Modeling Significance Levels	Monitoring De Minimis Concentrations[a]
Nitrogen Dioxide (NO_2)	1-hour	564 $\mu g/m^3$ 0.30 ppm [b]	---	----	----	40	---	---
	Annual	94 $\mu g/m^3$ 0.05 ppm[c]	100 $\mu g/m^3$ 0.053 ppm [c]	2.5	25		1 $\mu g/m^3$	14 $\mu g/m^3$
Carbon Monoxide (CO)	1-hour	26,450 $\mu g/m^3$ 23 ppm [b]	40,000 $\mu g/m^3$ 35 ppm [b]	----	----	100	2,000 $\mu g/m^3$	---
	8-hour	10,350 $\mu g/m^3$ 9 ppm [b]	10,000$\mu g/m^3$ 9 ppm [b]	----	----		500 $\mu g/m^3$	575 $\mu g/m^3$
Sulfur Dioxide (SO_2)	1-hour	1,300 $\mu g/m^3$ 0.5 ppm [d]	---	----	----	40	---	---
	3-hour	---	1,300 $\mu g/m^3$ 0.5 ppm [b]	25	512		25 $\mu g/m^3$	---
	24-hour	262 $\mu g/m^3$ 0.10 ppm [b]	365 $\mu g/m^3$ 14 ppm [b]	5	91		5 $\mu g/m^3$	13 $\mu g/m^3$
	Annual	52 $\mu g/m^3$ 0.02 ppm [c]	80 $\mu g/m^3$ 0.30 ppm [c]	2	20		1 $\mu g/m^3$	---
Ozone (O_3)	1-hour	196 $\mu g/m^3$ 0.10 ppm [b]	235 $\mu g/m^3$	----	----	40 of Volatile Organic Compound (VOC)	---	100 tpy VOCs
	8-hour	---	157 $\mu g/m^3$ 0.08 ppm	----	----		---	100 tpy VOCs

Pollutant	Avg. Period	MAAQS	NAAQS	PSD Increments ($\mu g/m^3$) Class I	PSD Increments ($\mu g/m^3$) Class II	PSD Significant Emission Rate (TPY)	Modeling Significance Levels	Monitoring De Minimis Concentrations[a]
Particulate Matter < 10μm (PM_{10})	24-hour	150 $\mu g/m^3$[3e]	150 $\mu g/m^3$[3e]	8	30	15 of PM_{10} 25 of PM	5 $\mu g/m^3$	10 $\mu g/m^3$
	Annual	50 $\mu g/m^3$[3f]	50 $\mu g/m^3$[3f]	4	17		1 $\mu g/m^3$[3f]	---
Particulate Matter < 2.5 μm ($PM_{2.5}$) (not promulgated)	24-hour	---	65 $\mu g/m^3$	---	---	---	---	---
	Annual	---	15 $\mu g/m^3$	---	---		---	---
Lead (Pb)	Calendar Quarter	1.5 $\mu g/m^3$[3c]	1.5 $\mu g/m^3$	---	---	0.6	---	0.1 $\mu g/m^3$
	Monthly	1.5 $\mu g/m^3$	---	---	---		---	---
Mercury (Hg)	24-hour	---	---	---	---	---	---	0.25 $\mu g/m^3$
Beryllium (Be)	24-hour	---	---	---	---	---	---	0.001 $\mu g/m^3$
Fluorides	24-hour	---	---	---	---	3	---	0.25 $\mu g/m^3$
Vinyl Chloride	24-hour	---	---	---	---	---	---	15 $\mu g/m^3$
Total Reduced Sulfur	1-hour	---	---	---	---	10	---	10 $\mu g/m^3$
Hydrogen Sulfide (H_2S)	1-hour	700 $\mu g/m^3$ 0.05 ppm [b]	---	---	---	10	---	0.2 $\mu g/m^3$
Reduced Sulfur Compounds	1-hour	---	---	---	---	10	---	10 $\mu g/m^3$
Fluoride in Forage	Monthly	50 μg/gm	---	---	---	---	---	---
	Grazing Season	35 μg/gm	---	---	---	---	---	---
Settable Particulate	30-day	10 gm/m^2	---	---	---	---	---	---
Visibility	Annual	3 x 10^{-5}/m	---	---	---	---	---	---

a. The monitoring de minimis concentrations apply only to new sources and modifications subject to PSD review. It determines if pre-monitoring will be required.
b. Not to be exceeded more than once per year.
c. Not to be exceeded.
d. Not to be exceeded more than eighteen times in twelve consecutive months.
e. The standard is the average of the expected exceedance for three consecutive years. The standard is attained when the expected number of days per calendar year with maximum 24-hour averages above the standard is equal to or less than one. For modeling purposes, it is calculated as the highest 6th high 24-hr average concentration for a five-year period.
f. The standard is an average of the expected means for three consecutive years. For modeling purposes, it is calculated as the highest five-year average for the annual value.

17. Identify all major and minor sources that are located within (50 km + maximum radius of impact) of the proposed source or modification. This determination must be made for each pollutant associated with the proposed source or modification that has total emissions greater than the PSD significant emission rates.

18. Provide a table that lists the proposed facilities emission sources, emission rates, applicable Air Quality permits, dates of construction, UTM locations, and increment consuming sources/emissions for each pollutant to be included in the PSD increment consumption analysis. This requirement has some overlap with the requirements listed in Item #3.

19. Based on the location and magnitude of the ambient impacts from the proposed source or modification, several additional Class I and Class II impact analysis may be required. The required impact analyses will be decided in part by the FLMs. The FLM of a Class I Area has an affirmative responsibility to protect Air Quality Related Values (AQRVs) and resources in any potentially affected Class I Areas which may be impacted by ambient pollutant concentrations.

20. As required by the Administrative Rules of Montana, Chapter 8, 17.8.824, the applicant must assess impacts to the following AQRVs for selected Class I and Class II Areas:
    a. Visibility
    b. Soils and Vegetation
    c. Secondary Growth Impacts

21. In addition to the AQRV analysis required by DEQ, the appropriate FLMs may also request the following modeling related AQRV analyses:
    a. Acid Deposition/Water Chemistry
    b. Ozone Exposure